



Issued Date: May. 28, 2010

Model No.: M220Z1-L03

Approval

TFT LCD Approval Specification

MODEL NO.: M220Z1-L03





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Approval**REVISION HISTORY**

Version	Date	Section	Description
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1. GENERAL DESCRIPTION

1.1 OVERVIEW

The M220Z1-L03 model is a 22 inch wide TFT-LCD module with a 4-CCFL Backlight Unit and a 30-pin 2ch-LVDS interface. This module supports 1680 x 1050 WSXGA⁺ (16:10 wide screen) mode and displays up to 16.7 millions colors. The inverter module for the Backlight Unit is not built in.

1.2 FEATURES

- Super wide viewing angle
- High contrast ratio
- Fast response time
- High color saturation (EBU Like Specifications)
- WSXGA⁺ (1680 x 1050 pixels) resolution
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Halogen Free

1.3 APPLICATION

- Workstation & desktop monitor
- Display terminals for AV application

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Diagonal size	558.68	mm	-
Active Area	473.76x296.1	mm	(1)
Bezel Opening Area	477.7 (H) x 300.1 (V)	mm	
Driver Element	a-Si TFT active matrix	-	-
Pixel Number	1680 x R.G.B. x 1050	pixel	-
Pixel Pitch	0.282(H) x 0.282(V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7 millions	color	-
Transmissive Mode	Normally White	-	-
Surface Treatment	Hard coating (3H), AG (Haze 25%)	-	-
Module Power Consumption	29.65	Watt	(2)

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	493.2	493.7	494.2	mm	(1)
	Vertical(V)	319.6	320.1	320.6	mm	
	Depth(D)	16	16.5	17	mm	
Weight		-	2820	2870	g	-
I/F connector mounting position		The mounting inclination of the connector makes the screen center within ± 0.5 mm as the horizontal.			-	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Please refer to sec.3.1 & 3.2 in this document for more information of power consumption.



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(1), (2)
Shock (Non-Operating)	S _{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V _{NOP}	-	1	G	(4), (5)
LCD Cell Life Time	L _{CELL}	50,000	-	Hrs	MTBF based



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+5.5	V	(1)

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	-	2.5K	V_{RMS}	(1), (2), $I_L = 7.0 \text{ mA}$
Lamp Current	I_L	3.0	8.0	mA_{RMS}	
Lamp Frequency	F_L	40	80	KHz	

Note (1) Permanent damage might occur if the module is operated at conditions exceeding the maximum values.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

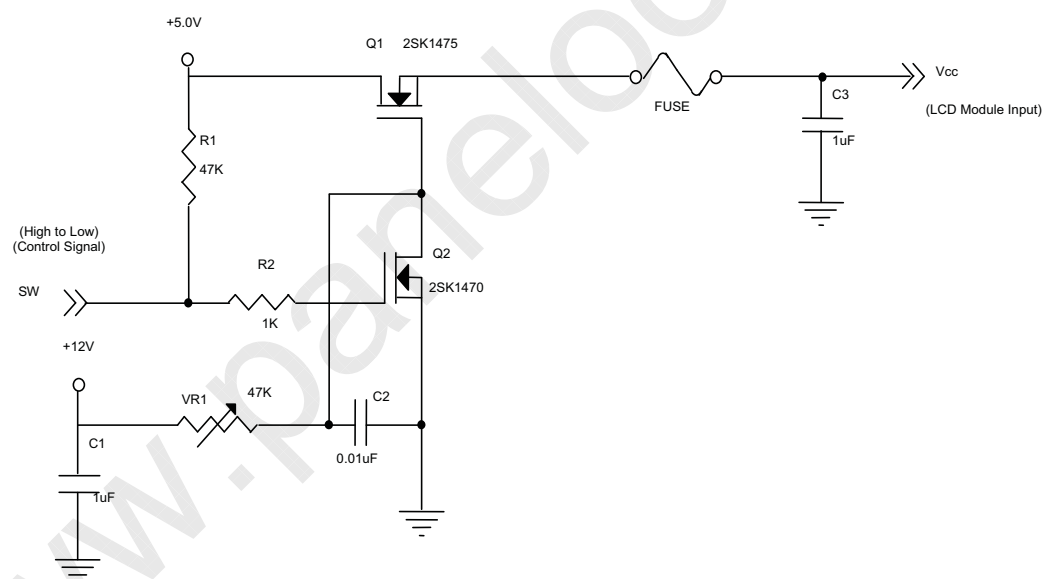
 $T_a = 25 \pm 2^\circ\text{C}$

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	4.5	5.0	5.5	V	-
Ripple Voltage	V _{RP}	-	-	250	mV	-
Rush Current	I _{RUSH}	-	-	3	A	(2)
AC off Rush Current	I _{off RUSH}	-	-	4	A	(6)
Power Supply Current	White	-	630	819	mA	(3)a
	Black	-	1170	1521	mA	(3)b
	f _v = 75Hz, V _{CC} =4.5V	-	1330	1729	mA	(4)
Power Consumption(without Backlight Unit)	PLCD	-	5.85	7.605	Watt	(5)
LVDS differential input voltage	V _{id}	200	-	600	mV	(7)
LVDS common input voltage	V _{ic}	-	1.2	-	V	-

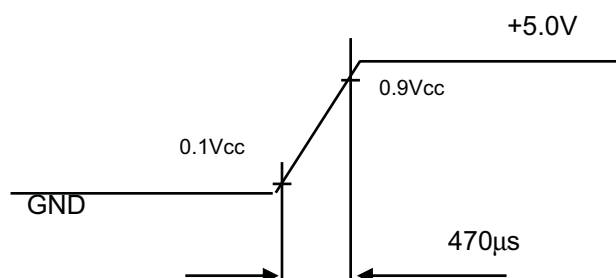
Above all conditions are V_{DD}=5.0V, all black pattern at 75Hz.

Note (1) The module is recommended to operate within specification ranges listed above for normal function.

Note (2) Measurement Conditions:

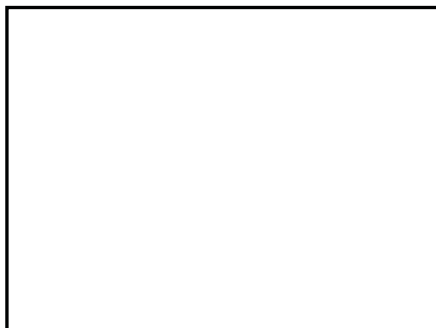


V_{CC} rising time is 470μs



Note (3) The specified power supply current is under the conditions at $V_{cc} = 5.0\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

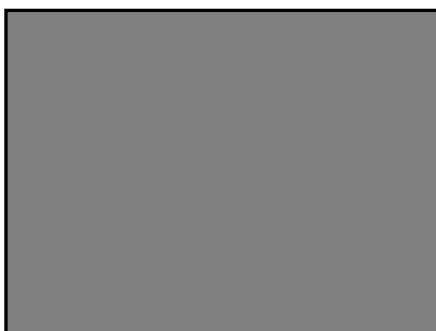
b. Black Pattern



Active Area

Note (4) The specified power supply current is under the conditions at $V_{cc} = 4.5\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, $f_v = 75\text{ Hz}$, whereas a power dissipation check pattern (Black Pattern) below is displayed.

Black Pattern



Active Area

Note (5) The power consumption is specified at the pattern with the maximum current.

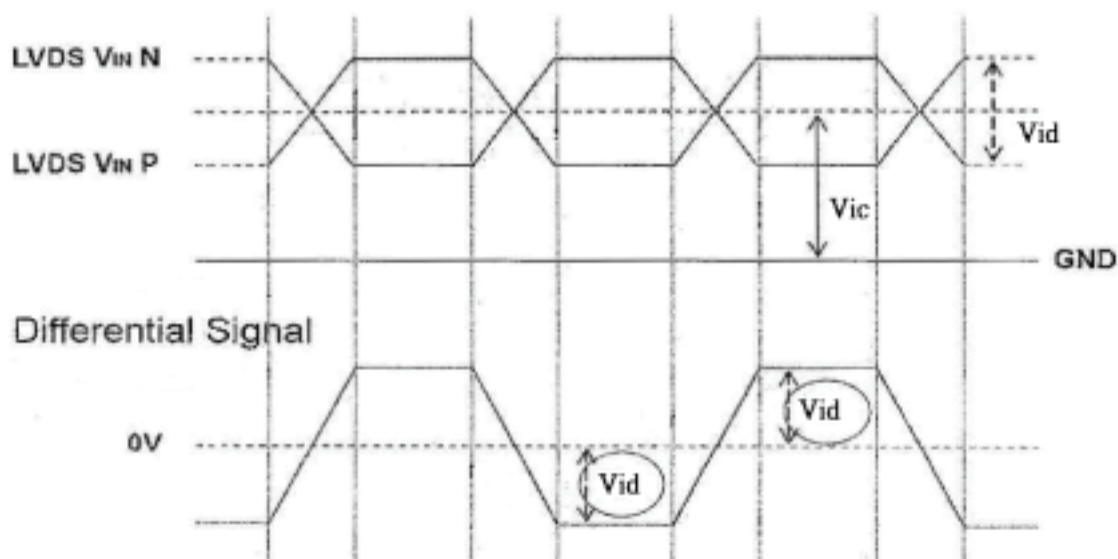
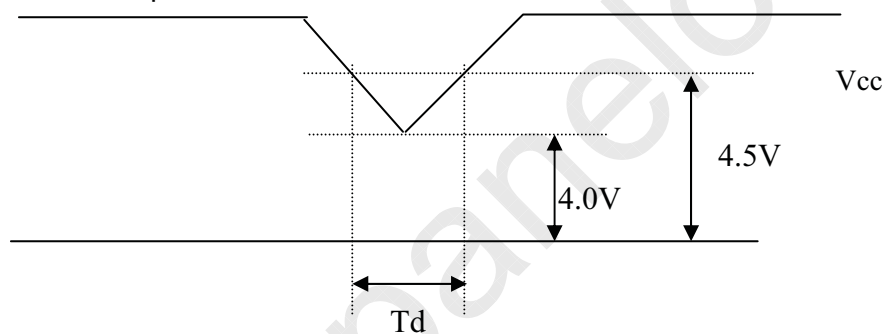
Note (6) The Rush Current would be happened when system doesn't follow Power Sequence in AC off status.

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Note (7) Vid waveform condition

Single-End**3.2 Vcc Power Dip Condition:**Dip condition: $4.0V \leq V_{cc} \leq 4.5V, T_d \leq 20ms$



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3.3 BACKLIGHT UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	738	820	902	V_{RMS}	$I_L = 7.0mA$
Lamp Current	I_L	3	7.0	8	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S	-	-	1350(25°C)	V_{RMS}	(2)
		-	-	1550(0°C)	V_{RMS}	(2)
Operating Frequency	F_L	40	60	80	KHz	(3)
Lamp Life Time	L_{BL}	50000	-	-	Hrs	(5), $I_L = 7.0mA$
Power Consumption	P_L	-	22.96	-	W	(4), $I_L = 7.0mA$



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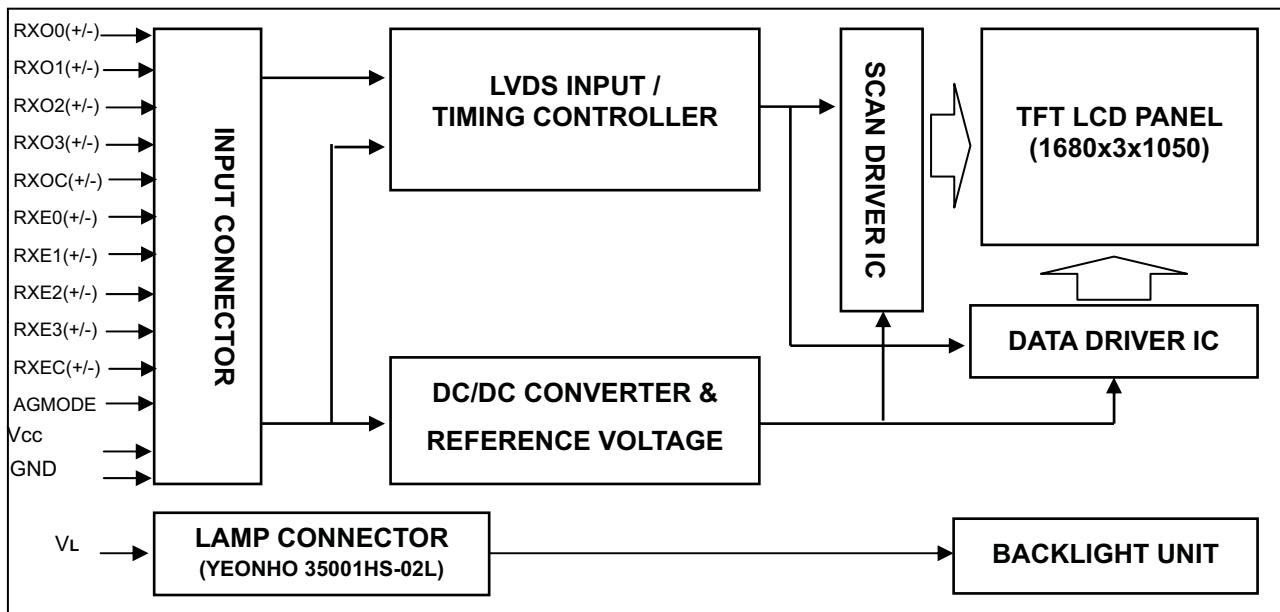
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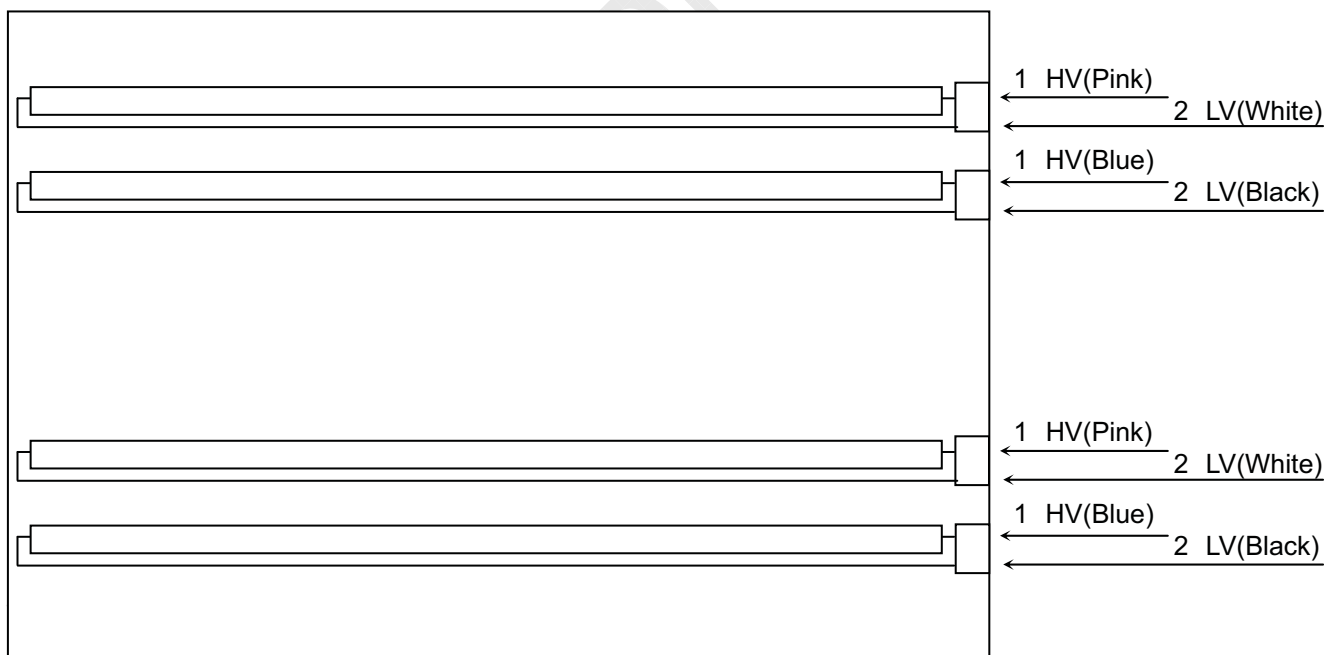
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4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT



Note: On the same side, the same-polarity lamp voltage design for lamps is recommended.



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	Not connection, this pin should be open.
26	VCOM	VCOM Control, should be open.
27	AGMODE	AGMODE should be tied to ground or open.
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply

Note (1) Connector Part No.: 093G30-B0001A(STARCONN) or MSAKT2407P30HA (STM) or FI-XB30SSL-HF(JAE).

Note (2) Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE).

Note (3) Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE).

Note (4) The first pixel is odd.

Note (5) Input signal of even and odd clock should be the same timing.



5.2 LVDS DATA MAPPING TABLE

LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6
LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6

5.3 BACKLIGHT UNIT

Pin	Symbol	Description	Remark
1	HV	High Voltage	Pink
2	LV	Low Voltage	White
1	HV	High Voltage	Blue
2	LV	Low Voltage	Black

Note (1) Connector Part No.: YEONHO 35001HS-02L or equivalent

Note (2) User's connector Part No.: YEONHO 35001WR-02L or equivalent

5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

[illegible]

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

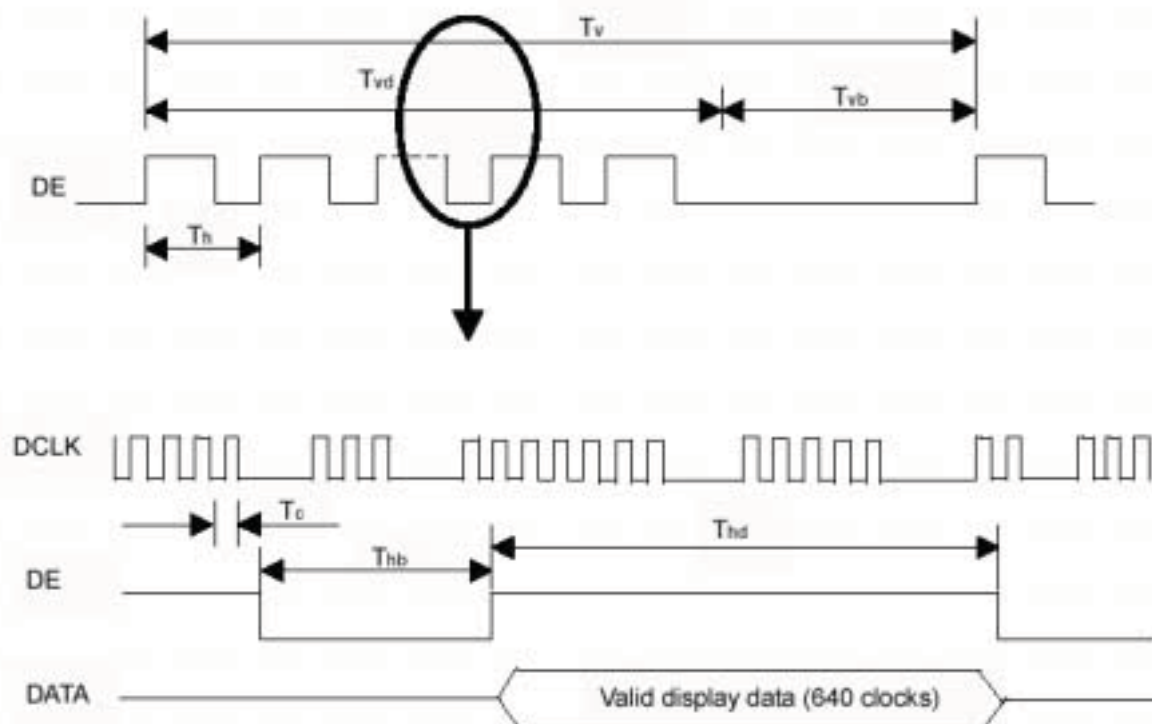
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

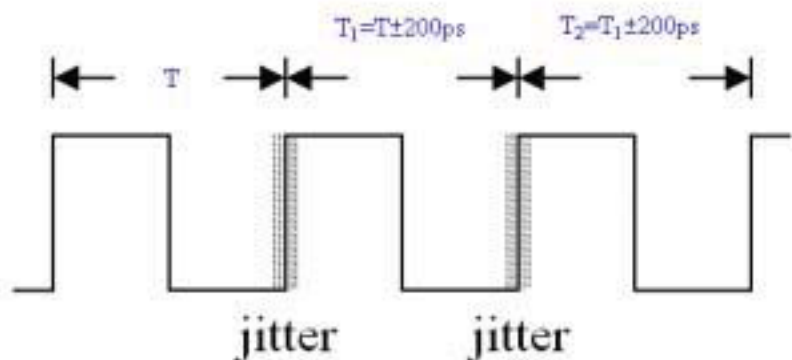
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	F_c	50	59.5	82	MHz	-
	Period	T_c	13.4	16.8	-	ns	-
	High Time	T_{ch}	-	4/7	-	T_c	-
	Low Time	T_{cl}	-	3/7	-	T_c	-
	Input cycle to cycle jitter	T_{rcj}	-	-	200	ps	(2)
	Spread spectrum modulation range	F_{clkin_mod}	$F_{clkin}-2\%$	-	$F_{clkin}+2\%$	MHz	(3)
	Spread spectrum modulation frequency	F_{SSM}	-	-	200	KHz	(3)
LVDS Data	Setup Time	T_{lvs}	600	-	-	ps	-
	Hold Time	T_{lvh}	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	F_r	50	60	76	Hz	$T_v=T_{vd}+T_{vb}$
	Total	T_v	1060	1080	1195	Th	-
	Display	T_{vd}	1050	1050	1050	Th	-
	Blank	T_{vb}	T_v-T_{vd}	30	T_v-T_{vd}	Th	-
Horizontal Active Display Term	Total	T_h	890	920	1000	Tc	$T_h=T_{hd}+T_{hb}$
	Display	T_{hd}	840	840	840	Tc	-
	Blank	T_{hb}	T_h-T_{hd}	80	T_h-T_{hd}	Tc	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

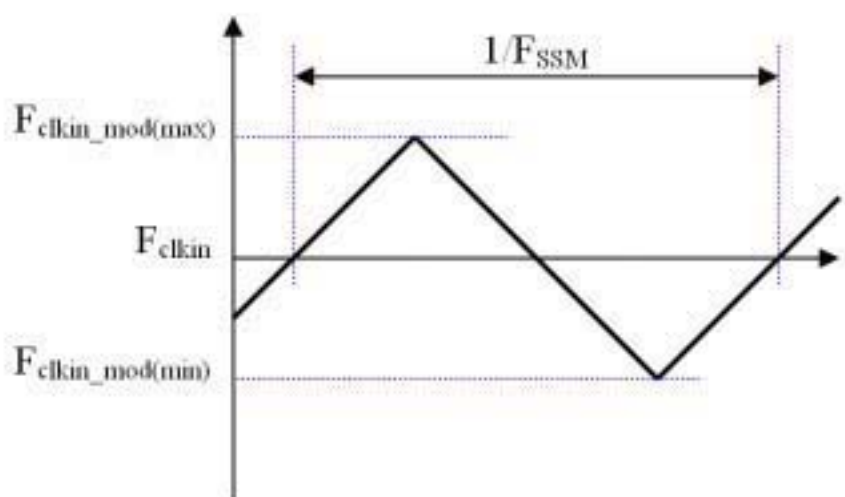
INPUT SIGNAL TIMING DIAGRAM



Note (2) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T_1 - T_2|$



Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (4) The DCLK range at last line of V-blanking should be set in 0 to 420.



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7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

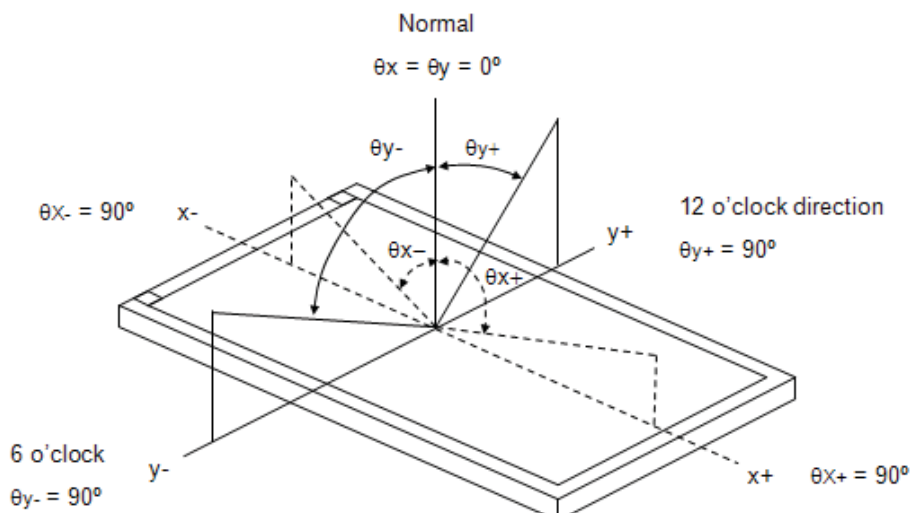
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I _L	7.0	mA
Inverter Driving Frequency	F _L	61	KHz
Inverter	Darfon VK.13165.101		

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	R _x	$\theta_x=0^\circ, \theta_y=0^\circ$ CS-2000 R=G=B=255 Grayscale	Typ – 0.03	0.649	Typ + 0.03	-	(1), (5)
		R _y			0.335			
	Green	G _x			0.283			
		G _y			0.605			
	Blue	B _x			0.151			
		B _y			0.073			
	White	W _x			0.313			
		W _y			0.329			
Center Luminance of White		L _C	-	250	300	-	cd/m ²	(4), (5)
Contrast Ratio		CR	-	700	1000	-	-	(2), (6)
Response Time		T _R	$\theta_x=0^\circ, \theta_y=0^\circ$	-	1.3	2.2	ms	(3)
		T _F		-	3.7	5.8	ms	
White Variation		δW	$\theta_x=0^\circ, \theta_y=0^\circ$	-	1.3	1.42	-	(5), (6)
	Horizontal	$\theta_x^+ + \theta_x^-$		150	170	-		

Note (1) Definition of Viewing Angle (θ_x , θ_y):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

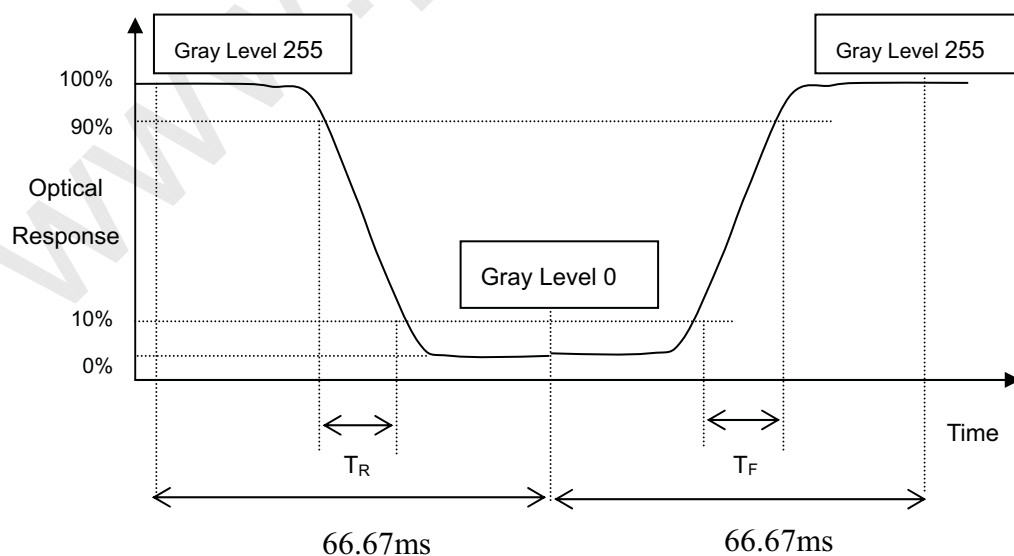
L_{255} : Luminance of gray level 255

L_0 : Luminance of gray level 0

$$CR = CR(5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R , T_F):



Note (4) Definition of Luminance of White (L_C):

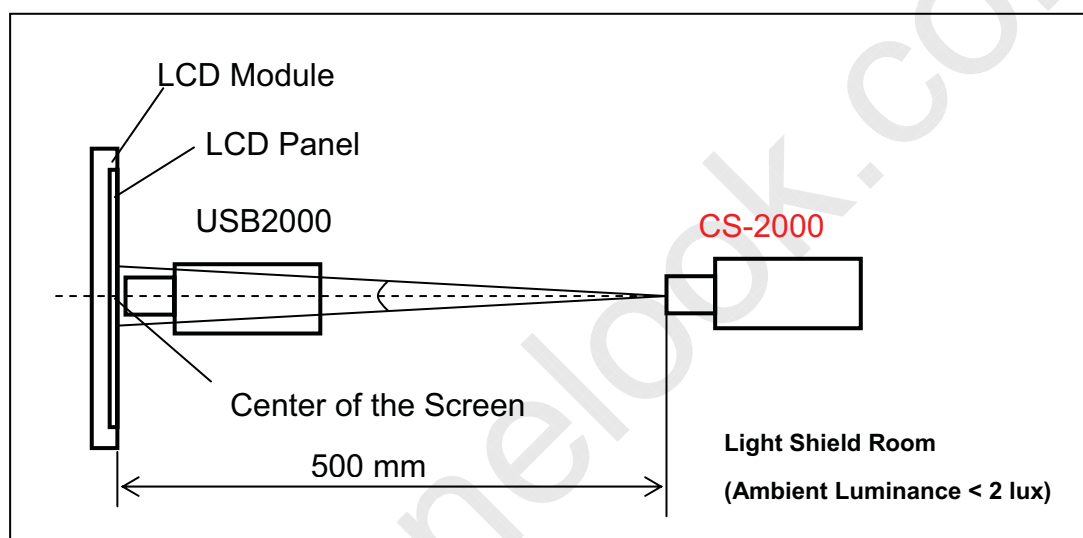
Measure the luminance of gray level 255 at center point

$$L_C = L(5)$$

$L(x)$ is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

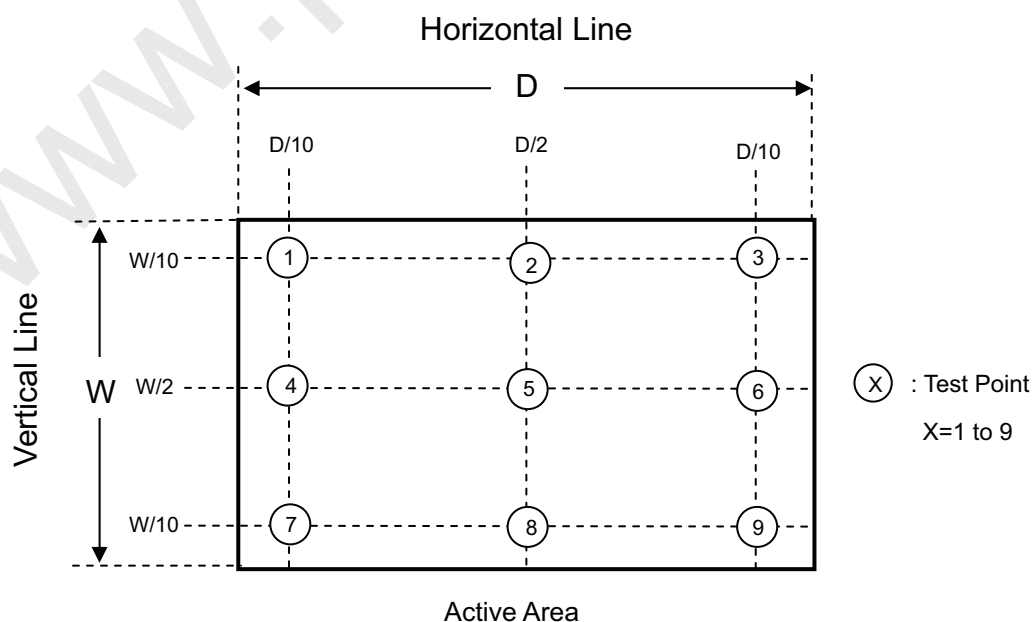
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

$$\delta W = \text{Maximum} [L(1) \sim L(9)] / \text{Minimum} [L(1) \sim L(9)]$$



8. PACKAGING

8.1 PACKING SPECIFICATIONS

- (1) 8 LCD modules / 1 Box
- (2) Box dimensions: 570(L) X 300 (W) X 430 (H) mm
- (3) Weight: 25.69Kg (8 modules per box)

8.2 PACKING METHOD

- (1) Carton Packing should have no failure in the following reliability test items.

Test Item	Test Conditions	Note
Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation
Dropping Test	1Corner, 3 Edge, 6 Face, 45.7cm	Non Operation

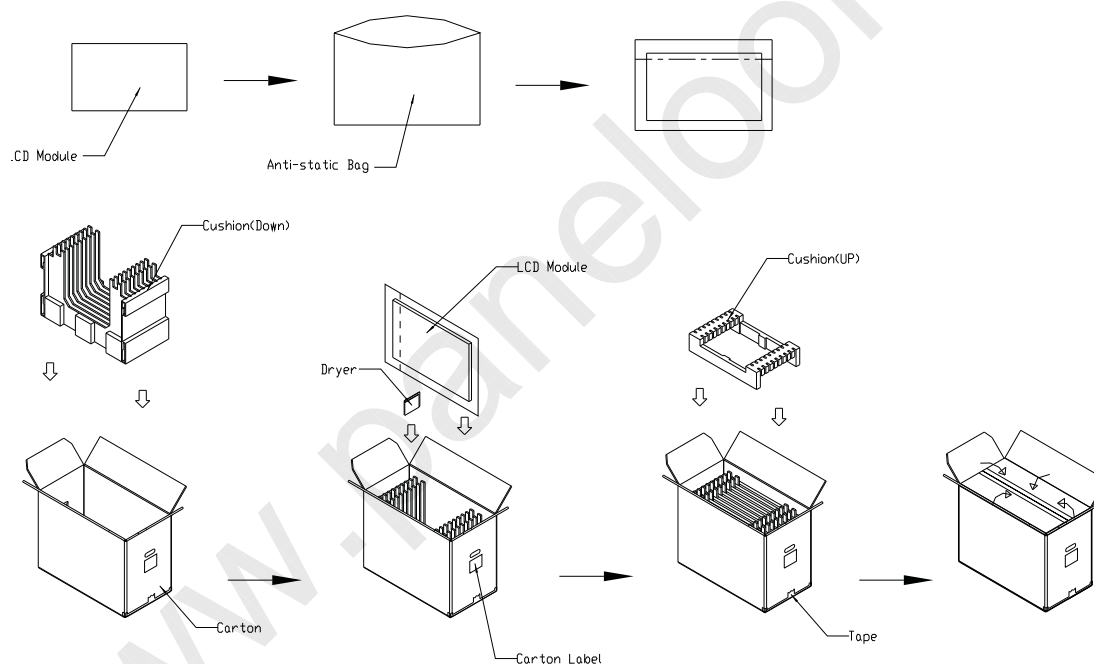
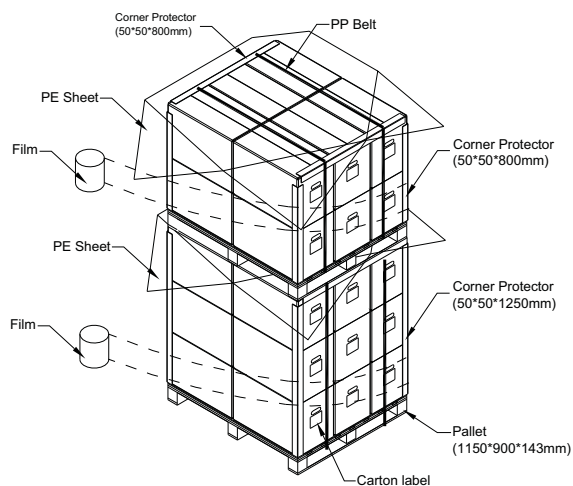
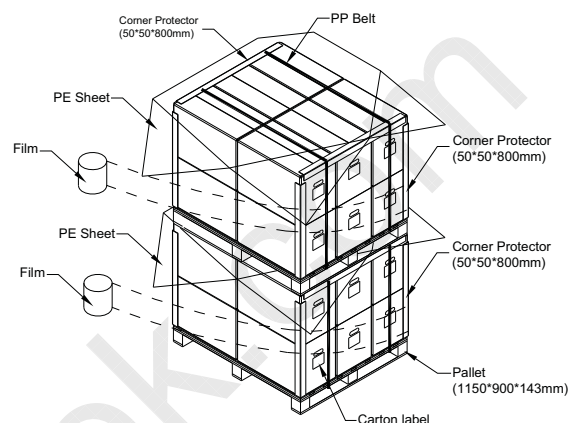
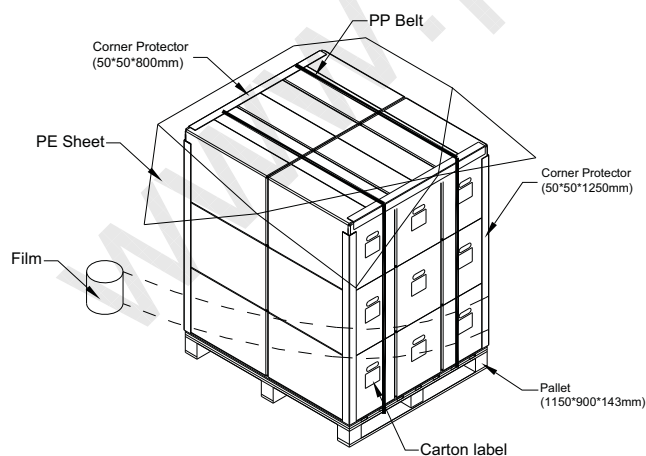


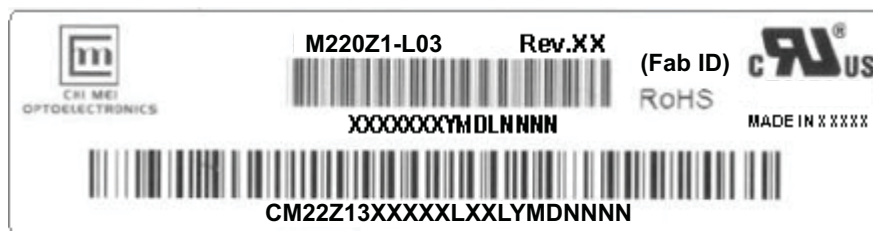
Figure. 8-1 Packing method

**Sea/Land Transportation****Sea / Land Transportation (40ft HQ Container)****Sea / Land Transportation (40ft Container)****Air Transportation****Figure. 8-2 Packing method****Air Transportation****Figure. 8-3 Packing method**

9. DEFINITION OF LABELS

9.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



- (a) Model Name: M220Z1-L03
- (b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.
- (c) CMO barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMO internal use	-
XX	Revision	Cover all the change
X	CMO internal use	-
XX	CMO internal use	-
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3...2010=0, 2011=1, 2012=2... Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U.
L	Product line #	Line 1=1, Line 2=2, Line 3=3, ...
NNNN	Serial number	Manufacturing sequence of product

- (d) Customer's barcode definition:

Serial ID: CM-22Z13-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMO=CM
22Z13	Model number	M220Z1-L03=22Z13
X	Revision code	ZBD: A~Z Non ZBD: 1,2,~,8,9
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C, OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M
X	Gate driver IC code	
XX	Cell location	Tainan, Taiwan=TN
L	Cell line #	1,2,~,9,A,B,~,Y,Z
XX	Module location	Tainan, Taiwan=TN; Ningbo China=NP
L	Module line #	1,2,~,9,A,B,~,Y,Z
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3...2010=0, 2011=1, 2012=2... Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	By LCD supplier



(e) UL Factory ID:

Region	Factory ID
TWCMO	GEMN / ()
NBCMO	LEOO
NBCME	CANO
NHCMO	CAPG

10. RELIABILITY TEST

Environment test conditions are listed as following table.

Items	Required Condition	Note
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Issued Date: May. 28, 2010

Model No.: M220Z1-L03

Approval

www.panelook.com



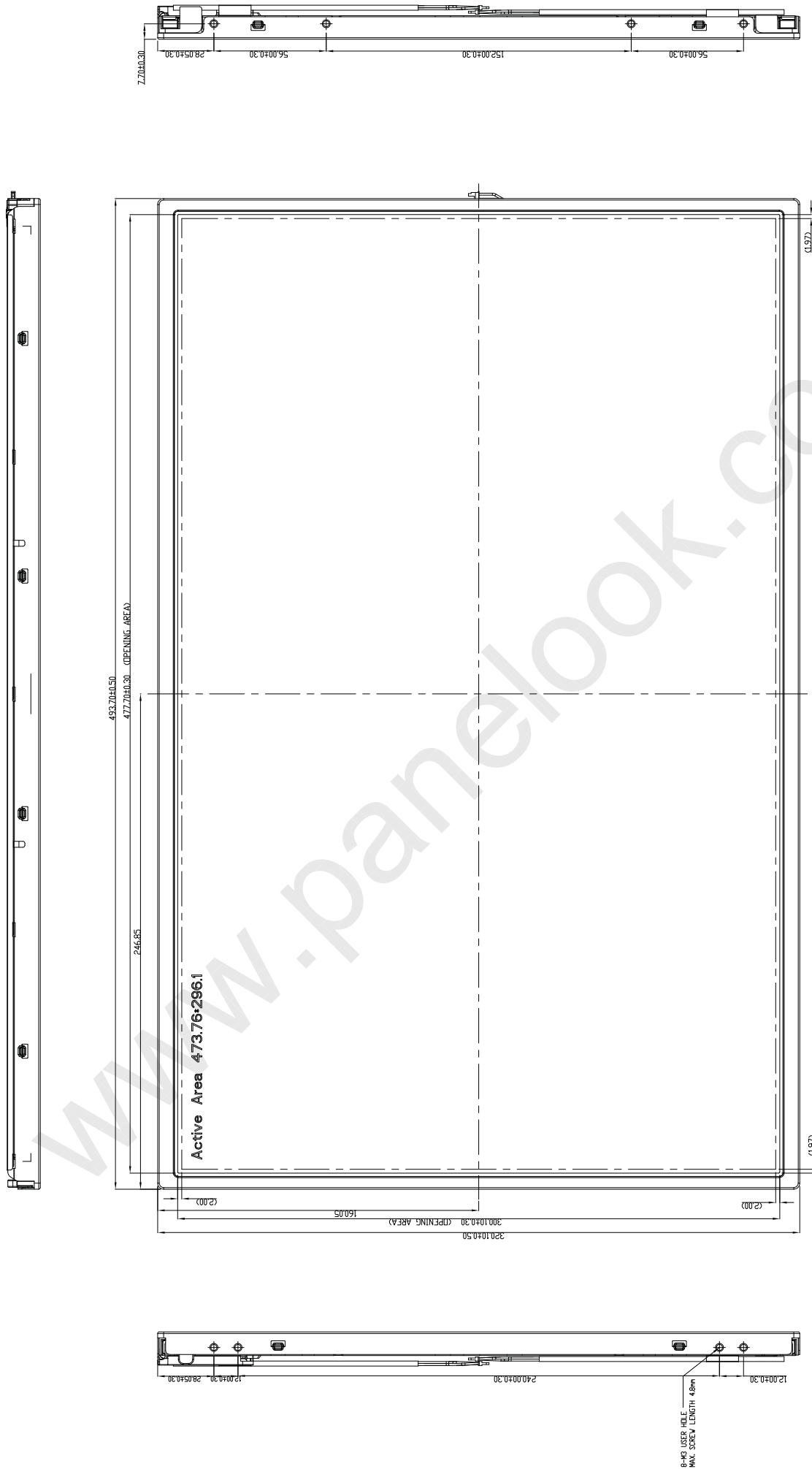
Issued Date: May. 28, 2010

Model No.: M220Z1-L03

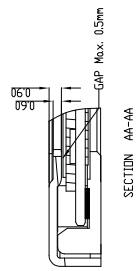
Approval

www.panelook.com

16151413121110987654321



NOTES:
1.DUTILE TOLERANCE: 40.5mm.
2.I/F CONNECTOR SPEC: STACONN 093630-B000A or EQUIVALENT.
3.SOLDER PASTE: 80/20/50
4.SOLDER MOUNTING: RADIATIONAL TORQUE MUST BE MAX. 5kgf-cm.
5.Clamp length: 484mm.



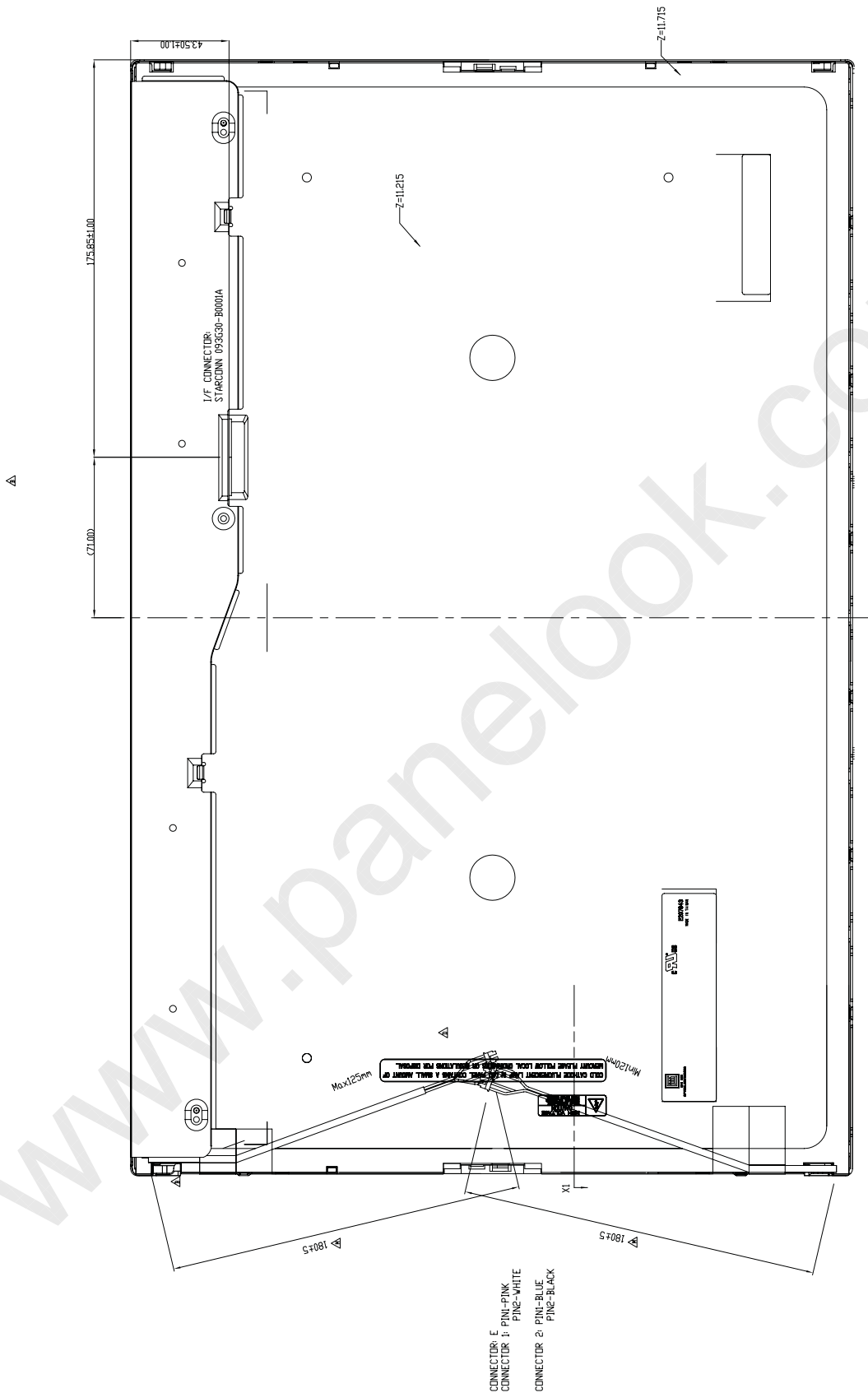
TITLE	DUTILE M2021-03999 9/9	Rev. 1/1	Rev. 1/1
Approved	TARGET_YANG	Drawing No.	M202103B
Checked	JUHYE_WU	Part No.	TBD
Drawn	JUHYE_WU	Material	TBD
Designer	J.S. JUNG	Date	2010.04.05
		Scale	1:1
		Sheet	1 / 2
		Unit	Unit:mm

CHI MEI

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Mark	update drawing	2010.04.05	JUHYE_WU	TARGET_YANG	EAO05280	ECN No.	Remark
	Description	Date	Changed By	Approved By			



NOTES:
1. OUTLINE TOLERANCE: +0.5mm
2. 1/2 CONNECTOR SPEC: STARCINN 093G30-B0001A or EQUIVALENT.
3. LAMP CONNECTOR YEDNHD 3500HS-02L
4. SIDE MOUNT HOLE ROTATIONAL TORQUE MUST BE MAX. 9kgf-cm.
5. Lamp length 484mm.

TITLE	OUTLINE: M2021-03090 999	2/2 REV. B
Approved	TARGET YANG	Drawing No. M20210309
Checked	JOYE WU	Part No. TBD
Drawn	JOYE WU	Material TBD
Designer	JOYE WU	Date 2010.04.05
		Scale 1:1
		Sheet 12 / 21
		Unit:mm

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Work	update drawing	2010.04.05	JOYE_WU	TARGET YANG	EAD055280	ECN No.	Remark
	Description	Date	Changed By	Approved By			